Biodiversity, Livelihoods and Struggles over Sustainability and Climate Change in Nepal

Ben Campbell
Department of Anthropology
Durham University

Some of Nepal's northern districts received assistance from the 1950s onwards to develop Swiss-style cheese-making dairy units, to benefit impoverished mountain communities keeping yaks and yak-cow hybrids. This brought them alternative livelihoods after the drop in economic opportunities when trade with Tibet diminished after the Chinese occupation, and the value of beasts of burden had dwindled. Income-generating transhumant dairy pastoralism subsequently suffered from state environmental management in the 1970s, and the introduction of national parks, which prioritized protection of biodiversity. The impractical nature/culture binarism of nature protection eventually yielded, however, to less misanthropic policy regimes involving buffer zones and facilitation zones in the late 1990s. In the 2010s, climate change agendas have revived the binary protectionist approach, at the expense of native land use practices, due to the perceived need to protect the eco-system services expected of the mountainsides in the era of the Anthropocene. But food security concerns along with the carbon lock-in qualities of smallholder agriculture are questioning these purportedly environmentalist narratives. This paper tracks the yo-yo oscillations of national and international policy, and considers the abilities of indigenous people, their animals and their gods, to carry on despite their economic world being massively impinged by opportunities for earning wages abroad; and what we can learn from them about transitioning to more sustainable landscapes .

Introduction:

The argument of this article is that anthropological perspectives in research about human-landscape interactions can facilitate the de-naturalisation of explanatory and predictive scenarios of environmental stability and change. Natural science is always part of the debate, but politics, economic utility, cultural heritage and the social diversity of relevant actors make it very hard to generalize about how landscapes are functionally perceived: as

for example oriented to production, recreational consumption, or conservation. This article discusses a part of the central Himalaya where the extreme diversity of ecological habitats is matched by a remarkable multi-scalar spectrum of interests, values, languages, and knowledges of practical governance, and ritual engagements with the landscape. Animals have been, and in many cases still are, vitally important in these relationships, but along with the effects of neo-liberalism, fragile states, and climate change, the symbolic and pragmatic relationships with animals are presenting post-peasants and policy-makers with hard choices, and uncertain situations for the consequences of their choices.

Characteristics of the Himalayan region give rise to a radical contingency of place:not just in terms of distinct ecological settings, but also socially situated contexts for action..This defies grand narratives and generalisable theories for landscape change. Three studies in particular (Thompson et al 1986, Ives and Messerli 1989, Smadja ed 2009) are exemplary works that deconstruct natural-scientific hubris by critical interdisciplinary thinking, and purposeful comparison of case studies. They all argue that it is necessary to make informed decisions about landscape management policy that affect communities of local people. This needs to appreciate the relationships of people to their homelands and to their animals. I propose here that a political ecology approach combined with an ethnographic interpretive perspective regarding sentient ecology is helpful to understand how peoples' lives, their environmental knowledge, and their relationships with livestock are undergoing change, in order to think about possibilities for participatory environmental governance. , .

Animism and Infrastructure at Altitude

In 1988 I walked up a valley in Nepal to look for a research fieldsite for my PhD, where I had previously trekked in 1980. This followed a trekking route that would take me to a valley of alpine pasturelands with yak herds (Langtang), which was the nearest such place accessible to Kathmandu. In the meantime, a dirt road had been constructed, and the original pathway was no longer maintained, now that busses took trekkers much further up the valley for starting their pedestrian onward journey. I pursued what seemed the main track and found myself wandering across patches of landslip and rough pasture for a couple of hours in solitude, leading into a low forest of rhododendron trees and bamboo. Turning into an opening in the forest, I saw what I would later know to be *godi.* This is a simple pastoralist's structure of three rows of straight posts, making an inverted V shape, over which bamboo mats (*bagari*) are stretched to keep the rain off. A dog barked from

inside and a man looked out at me, stroking his buffalo calf to keep it from fearing this intruder, and the commotion I had caused. I gave a brief greeting and continued on my way, leaving with a deep sense of having stumbled into another world.

Over the next three years, I returned for fieldwork with the Tamang speaking people of Rasuwa District and studied their system of transhumant agro-pastoralism, yo-yo-ing up and down the mountain slopes to keep the needs of animals and crop cultivation in synchronicity. I spent from autumn 1989 to autumn 1991 tracking the movements of people and livestock and the locations of their *godi*-dwellings around one specific village (Campbell 1993). This was at the end of the Panchayat political regime, and indeed the movement for democracy in Nepal overturned the Panchayat one-party system in April 1990. The Tamang-speaking people had not done well in the Panchayat years, as the kind of idealised village subjects (Pigg 1992) of Nepalese national modernity (educated, Hindu, rice-eating, Nepali-speaking) did not match their socio-cultural realities (illiterate, Buddhist-shamanic, local porridge-eating, Tamang-speaking). My fieldwork livelihood surveys were conducted in the Tamang language with forty four households, and revealed that the most common path to domestic economic wellbeing consistedin maintaining two milking buffaloes. The milk could be sold in the district capital where the new road led, with a number of newly built government offices. These were peopled by bureaucrats, whose idea of professional well-being includes drinking plenty of milk tea in those offices.

The mothers and daughters in the village economy spent long days cutting fodder for their hungry water buffaloes, and on marriage a clan daughter could normally expect the gift of a young buffalo as her dowry (Campbell 2000). In addition to milk, water buffaloes produce an enormous amount of manure for fertilizer (Hoffpauir 1978). There were cows too that gave much less milk, while the oxen were used for ploughing the fields in which wheat, barley, potatoes, maize and finger millet were grown to feed hungry mouths. Rice was a luxury for most, only eaten at festivals. A very few households held land way down the mountain side by the fast running Trisuli River. Most of the buffalo-keeping *godi* went down to the riverside to enjoy the winter warmth among wild banana and mango vegetation, where their animals continued to lactate on the healthy supply of big-leafed nettles (*nye pimba* – 'they give milk') and other forage plants. Village flocks of sheep and goats would also descend down here in winter to manure the fields in domestic parcels,

while in the summer they would all be collected together and rise up to the subalpine meadows, staying ahead of the emerging leeches when the monsoon rain began to fall. Households without enough land and livestock to feed themselves would regularly send sons to work as seasonal porters, for trekking or as road builders in Nepal and parts of India too. It was a locally relevant definition of not being poor if a family said they did not have to send members to go and carry loads for a period of the year (Campbell 1997). Some people also began working in the textile and carpet industry in Kathmandu in the early 1990s.

I got to know an older couple in the village, who used to keep a yak, to cross fertilise with local cows and produce the hybrid female *chauri* that produce about the same quantity of milk as the water buffaloes. The old couple said they had given up with the yak *godi* as it got too lonely for them to stay up at the higher pastures after they became grandparents, and when they tried to put a hired cow hand to look after the operation, he didn't care well enough for the animals, and lost some calves to a leopard. The female hybrid calves (*chauri*) fetched a good price among the next village's high altitude herders who supplied milk to a government yak cheese factory that was established in 1970, promoting income generation in this relatively remote district, and for which loans to acquire milking beasts were made available by the Agricultural Development Bank.

This entry point of capital to the transhumant economy was designed to achieve national economic development goals based on shifting the logic for production from one of subsistence use, to a logic of producing commodities for exchange (Schrader 1988). This would enable possibilities for profit by moving the produce from zones of production to meet consumer demand elsewhere, and lead to more overall efficiency of production. Other commodities deemed appropriate to the cooler, specialist ecological zones of Nepal, included temperate fruit trees such as apples, pears, and apricots. From the Tamang perspective the yak cheese adaptation to cash economy did result in having to reorganize domestic labour to maintain active satellite herding units looking after separate *godi* dedicated to dairying herds and breeding herds respectively. There was however, a particular reason why for the specifically Tamang clans a subsistence consumption logic persisted in this economy of yak–cow hybrids. Still-born calves, and animals lost to accidents, disease, or leopard attack, will go into the cooking pot on a Tamang hearth. For other ethnic groups in predominantly Hindu Nepal, this is strictly taboo.

The intensive work regime of transhumant agro-pastoralism was massively constrained by the presence of the Langtang National Park after its creation in1976. Villagers could no longer maintain areas of pasture by selectively burning the weed growth (as a result of this ban devastating big fires periodically occured). Nor could villagers control the predation of many species of wild animals on their subsistence crops. Hunting was banned. Fire was banned. Forest product exchange was banned. Movement of livestock into Village Development Committee areas where the livestock owners did not own land was banned. The national park also kept up a campaign against the *chauri* herders, insisting the animals were destroying the habitat and food sources of the red panda, the musk deer, and other species like Himalayan tahr. Through the 1970s and 80s the Theory of Himalayan Environmental Degradation (Ives and Messerli 1989, Guthman 1997) was a dominant framework for viewing population growth and poverty as causing large scale deforestation and soil erosion. It presumed peasant ignorance and an intrinsic conflict between interests of local livelihoods as opposed to biodiversity conservation. It had no concern for the local people's attention to and interdependence on their intimately known landscapes.

Above the tree-line, in flowering yak meadows, are a series of lakes, of which the most famous is Gosainkund. This is the destination for pilgrims at the full moon of August, who come from Kathmandu and even India to visit the site where in myth the Hindu god Shiva struck his trident into the rock for the waters of the source of the Trisuli River to flow. The Tamang-speaking residents follow this pilgrimage with a different mythical charter for action, which is to make requests through their shamans (*bombo*) for a series of blessings from the god of the mountain. These requests can be for abundant crops, fertile livestock, long life, a child, or simply money. In the opposite season of mid-winter, another pilgrimage is made to a cave way down below the Gosainkund massif. Here a miraculous 'self-originating' lingam of rock at Shikar Besi embodies Shiva's presence. The mythical explanation for this site tells of a cow-herd, who could not understand why one particular cow kept disappearing in the day, and yet returned in the afternoon with no milk in her udder. The herder followed her, and found the cow entering the cave and discharging her milk on the conical lingam. All the big herding families from Rasuwa and neighbouring Yolmo (Bishop 1998) came to participate in this pilgrimage, pouring litres of their animals' milk over the natural lingam in expectation of a blessings for a productive season in the coming year. Some villagers also told me the big herders were in addition trying to offset

their sinfulness at killing the bull calves by excessively feeding them salt till the calves consume so much milk their stomachs rupture. Killing a cow or yak cow hybrid is a crime in Nepal (even since it ceased having a Hindu monarch as head of state and became a republic in 2008).

As the 1990s progressed, a combination of environmental policies from the national parks buffer zone programme, the growth of civil insurgency by the Maoist movement's People's War, and the active recruitment of workers from Nepal to migrate to the Gulf and Malaysia put an end to the system of peasant productivism described above. Maoists demanded money off the yak-cow hybrid breeders. The state ceased any significant rural livelihood projects apart from national park buffer zone projects that substituted cash-bought commodities for forest-derived resources. In this time, the extensive transhumant agro-pastoralism of pre-war times retreated into a much reduced form of keeping a few goats and cows. As part of the recovery from civil war, the Asian Development Bank sponsored a series of road building projects to bring 'connectivity' to a number of poor districts in Northern Nepal. Rasuwa District was one of those selected, and the pre-modern infrastructure of pathways into Tibet crossing the border at Rasuwa Gadhi was to be upgraded by a linking road between the Tibetan border and the Nepalese dirt road that only reached to the small bazaar town of Syabru Besi. This was also the location of a hydropower plant that was hurriedly built by 1996 to meet the shortfall in electricity experienced by Kathmandu, especially after the World Bank pulled its funding for the megadam project in the east of the country known as Arun III. The road was designed to meet the development needs of a somewhat 'remote area' and was in policy documents intended for local people to benefit from increase in trade and the volume of economic activity (Campbell 2010). The economic project of national integration would now be promoted by advancing road infrastructures to the borders with the great neighbour to the north, after the road systems with India had been developed decades before.

Financing transitions and landscapes of federal accounting

The flight of labour out of village subsistence economies, a 'highland clearance' of its time, was occurring in parallel with a new political ideology of territory. The programme for change led by the Maoists had significant support from the Indigenous People's movements seeking recognition, historical restitution of injustices, and redistribution of power in the nation to turn around the corrupt siphoning off of development funds by the Hindu high

caste elite. The division of the country into provinces based on the historical concentrations of ethnic groups was under discussion for the new constitution. The predominantly Tamang cluster of districts would be called Tamsaling. This political movement for federal decentralization was echoed in many of the songs, videos and social media networks used by the overseas migrants to stay in touch with their homelands. It also became stabilized as a theme of belonging as political entitlement among the new ethnic associations. Even new patterns of marriage alliance conducted by truck drivers and hydro-power workers worked to further extend the sense of territorial solidarities across districts and valleys which had previously not be easy to access for people who held much in common. New collective subjectivities of territorial landscapes were being generated through claims arising from alliance in civil conflict, assisted by migration and infrastructure expansion. Here we have a post-peasant relation to landscape fostered by diaspora subjectivities, migrant labour, phones, digital technology and a roll out of infrastructure projects extending links to the growing economies of the region drawing on Nepal's labour power.[1]

As a consequence of the move out of subsistence, pasturelands entered a new space of attention as fields of financial calculation. While the loss of labour and the cheapness of shop-bought cereal grains brought an end to the intense scale of reciprocal work groups, which I had charted in 1990-91 (Campbell 1994), there was new interest in generating cash from cheese production. Apart from the government cheese factory making a Swiss style yak cheese, local dairying units were cropping up making *durka*. This is a very hard dried cheese made in thin rectangular blocks, which are cut into small cubes and put into the mouth to be sucked, like a boiled sweet or a piece of betal nut. The high demand for both the dried cheese and the European style cheese led to several new private enterprises cropping up in the district. The national park denied permission to create new dairying units within its territory on the basis of the fuelwood scarcity. Arguments had already been made into a conflicted demarcation of interests and binary alternatives pitting Nature against livelihoods. These concerned the degrading of forest bioversity into pasture by diverting forage species from wildlife to cattle, and the rate of fuelwood extraction used in pasteurising milk and making cheese exceeding biological capacity for forest regrowth (Fox et al. 1996).

[1] On the region's road infrastructure developments see Murton et al 2016

The basis for this kind of institutional-epistemic denigration of pastoralists by colonial scientific forestry is well discussed in Blaikie and Sadeque (2000), and Springate-Baginski and Blaikie (2007). An exceptional dominance of forest science in policy areas dealing with biodiversity led to a default antagonism towards herding livelihoods and associated local knowledge, as well as a blindness towards rangeland biology. The mentality of zero-sum carve-up of biotic value chains is a poor basis for making sustainability diplomacy by a poorly funded state protection system, set amongst angry, poor and marginalized indigenous people. To his credit, the late Pralad Yonzon, the leading ecologist to have studied the red panda (Yonzon 1988), and co-author of some of early articles on the need to control cattle in the Langtang National Park, did articulate in the newsletter 'Habitat Himalaya' the need to better understand rangelands and accommodate the rights of herders in consensual pasture policies. The shortsightedness of the national park is sometimes hard to appreciate, as significant income streams come to the park from tourists not only wanting to catch sight of wildlife, but also to interact with yak herders, and buy a lump of delicious cheese, or a knitted woolly hat from local people. The cheese factory also pays to the park several hundred thousand rupees a year for the entitlement to collect dead wood, and towards costs of fencing and reforestation (Campbell and Sallis 2013).

In the political space of post civil war public contestation of authority, and with the legitimacy of the state undergoing extended crisis, the control of protected areas and national parks has been a matter of concern not only for emboldened citizens on the receiving end of regulatory discipline, but also at national policy level. So has it been for hydro-power development. The head of the Nepal Electricity Authority for Rasuwa District in 2014 was from the Tamang ethnic group and proved exceptionally popular with plans to extend several 'run of river' hydropower installations along the Trisuli Valley bottom and up the course of the Chilime river that is outside the area of the national park. Efforts to remove the district NEA head by the centre led to mass mobilization and road blockages in Rasuwa, against the Kathmandu energy ministry. In contrast to the stand-off over pasture and fuelwood access between local people and the national park on one side of the river, the public-private investment into hydro-power has proceeded at pace by granting special share entitlement to district residents, which has created a more buoyant culture of ethnic entrepreneurialism.

(map of Tamsaling)

The high peaks of the Himalayas have been re-evaluated as a resource of fast flowing water courses ('White Gold') of which only a fraction of potentially feasible hydro-generation has so far been undertaken. As in other parts of the Himalayan chain, there are political alliances and movements to prevent a simple discharge of value and benefit downstream from the generating districts to the urban centres or the plains societies below. Sikkim is a strong example of this (Arora 2014, Subba 2014). Within Nepal the ethnic territory of Tamsaling happens to be one of the best endowed for hydro generation. The area already contributes over 40 % of all Nepal's hydro-power, so it is questioned why this area itself is only grid connected for 50% of households (Tamang n.d.). If not only natural resources of the forest but also hydro-power could be influenced by the proposed structure of ethnic federalism, more development benefit would take place in forms and localities accessible to the neglected communities of Tamsaling's districts. The terms in which these issues are articulated and find traction are bound up in the surge of ethnic awakening and claims of territorial belonging that populate the landscape with ancestral presences responsibilities, and agendas of historical injustice. The rivers that flow from the mountain tops are not a simple resource of property. The water courses interweave with flows of migratory passages that gather community relationships along their routes (Fisher 2001 Rademacher 2010) and draw claims of political control. Deities, kings, state projects, and companies vie with the more workaday interactions of villagers who recognize and ritually attend to local spirit lords of water sources, river beings, and the local spirit sovereigns dwelling on ridges and peaks , who are said to affect the fortune of cultivators, livestock herders, and hunters. Emboldened by Nepal's adoption of the International Labour Organisation's Convention 169 on the rights of Indigenous and Tribal Peoples, the matter of territorial rights has diffused into the senses people now adopt in speaking of turning round historical injustices, and looking into new arenas of relevance for their domestic aspirations and practices of 'commoning' (Escobar 2007).

The federal project gave impetus to reconceiving old narratives of marginalization and avoidance of the Nepalese state (Mukta Singh Tamang's thesis argues this is deliberate in Tamang oral and written histories of their society), and reorienting them to issues such as resource control and energy generation A certain clarity of perception comes to people's minds from the experience of upheaval in the polity of Nepal, and overturning of expectations engrained in peasant norms of continuity. The worlds of livelihood and

belonging have been pulled out of parochial contexts to a current situation where horizons of extensive dispersal are affecting people's sense of belonging. These include the subjectivities of migrants somewhere far off, while mothers care for children whose fathers are no longer absent for a couple of months but a couple of years, in places they may creatively name as 'the meadow of somewhere, wherever' (*kana-tang-tang*). At the same time there is a strong awareness that whatever the activities of ethnic political movements, peoples' migratory labour trends, and their shifting interests in aspects of economy such as pastoralism, it is the case that the parochial dynamics of place - as ecological sites of seasonal passing and replenishment of life in webs of connection between forests, soils, water and skies - are incontestably not what they were. This awareness will be set in the context of scenarios for new sustainable relationships with landscape, and how landscapes can be reintegrated for social and enviuronmetal justice.

Climate changes and extra-human ethical responses

My first direct, conscious encounter with climate change in Rasuwa District happened in March 2009. It was an experience that shook my research attention. It brought me to think about a new set of material chains of effect and their political and cultural consequence, than those I had been expecting to follow up at the time, which had been in relation to the aftermath of Nepal's civil war. The most immediate area of social life affected was the local food system.

The old subsistence system for deriving hard earned use value for the local environment was calibrated on seasonal predictability. In March 2009 things were unrecognisable. Not a drop of rain had fallen since the end of the previous monsoon. Unirrigated mountain agriculture depends on occasional winter rainfall. The terraced fields which at this time should have supported ripening wheat and barley in one area, and in another area should have just begun showing newly germinated maize seedlings, instead revealed a brown, dried-up fan of unproductive mountainside.

I had visited two years before when the end of the civil war had brought some reasons for optimism in the country, and people were rebuilding their communities and livelihoods. On this visit, however, the generation of people I had known since the panchayat era pointed to the parched soils and told me "*nyima shijim praba*" ("we are walking dead"). Compared to the things people had to endure in the civil war, and the impacts of outmigration for

work abroad on villagers' capacity to keep going with subsistence farming and livestock in their transhumant agro-pastoral system, this drought was a hammer blow to these people's own sense of having the capacity to feed themselves. The civil war had been rhetorically handled by the Tamang villagers by maintaining some pragmatic distance to the conflict's central objectives of state capture. They used the trope of 'We are poor mountain people. We have no rich people here' to deflect attention from both security forces and the insurgents.

With this drought though, and forest fires, things were far more serious. The basis for Tamang village life was more existentially at risk. Their capacity for self-reproduction through cultivating crops as an element of maintaining relationships with territorial deities, soils, fields, animal and plant species and unseen forces was blown away. Climate changes were taken as signs of relational breakdown and communicative impasse, enacted by willful agents of harm. This non-human threat was not containable as an effect of the same old structural neglect from the developmental state, but signified a post-normal environment of relational unease.

The responses to this sentient landscape that has become more cantankerous, unpredictable and spiteful has been notable in an increasingly semiotic effort to tell the territorial deities they are being thought about and looked after. I borrow here the logic that Kohn sets out in *How Forests Think,* but this is not to suggest the exact same principles of communication are at work in the case of Ecuadoran Runa and the Tamang. The communicative imperative for diplomacy with the earth, water, wind and sky has been marked for example in enclosures built around clusters of trees, and prayer flags on poles signifying to people not to damage or disturb the abode of a wayside sovereign. Around this water source and walnut tree grove, a low stone wall was erected with the direct purpose of averting people from unknowingly encroaching on this parochial, but potentially very unpleasant power place.

Villagers also told me how they made a claim for funds from the district soil and water conservation office to repair a pathway that leads up to a spot in the forest some two hours walk above the road. Here there is a continuous flow of water at all times of year. This is healing water (*men chu*) and people will come with a shaman (*bombo*) for a number of ailments, but especially afflictions of sight. I attended with two men, and the *bombo*

chanted for almost half an hour with some make-do incense smoke made from some branches to one side, while he addressed the seven continuous water spouts and rhythmically flicked grains of rice to keep the water deity's attention. (I once asked the old village *bombo* what among all these local spirit entities makes the difference between a potentially helpful god and a malevolent being (*mang*), to which he replied, a god is one you have fed, the malevolent ones are those you haven't.)

In contrast to this water source that has stayed reliably flowing (and was not even disturbed by the terrible earthquake that hit in April 2015), in the pre-monsoon drought months of 2009, I was invited along with a group of men surveying the possibility for starting a private cheese-making unit. We went to the water source for the stream that gives the name for the village. Even this would not have served as the base for a herding shelter as it was merely a damp patch with a ring of pebbles indicating the point of emergence, and literally no trickle was visible. The feasibility trip was over. No pasturing enterprise was possible there.

Two seventy year old chauri herders spoke to me in 2011 about their concerns for their enterprise. Here was no doubt the financial prospects were favorable. They had thirty milking animals, and the price was good for the milk. The trouble was one son had died working in Malaysia, another lived in the city, and their daughter did not want to take over the herding operation. The old woman asked rhetorically should she sell up, or even buy more animals? Just when a good living could be made, the children have abandoned the fruitful lifeways that previous generations aspired to.

Similar accounts with more extensive quantitative evidence are contained in relation to the extent of yak distribution and herding practices in process of change in *Yak on the Move* (2016). Numbers in yak herding are falling, the viability of herding livelihoods are constrained by diminished genetic diversity, and regulatory impacts on trans-border movements have led to more isolation between the pockets of relative concentration. However, the figures on sheep numbers would, I guess, show a far steeper decline. The appeal for the lifestyle of lonely isolation and the low prestige of personal reputation has done for the village common flock. Goretex imitations and synthetic fleece have supplanted the need for the all-weather warmth and wood-smoke odours of the woollen *baku* half-sleeve jacket. It is a transition of seemingly irreversible direction that has taken place.

Re-purposing the pasturelands of Nepal

Storylines of climate change enter the landscape through different perceptions of effect, registers of concern, and attendant power relations. Villagers interpreted the direct experience of drought and devastating, roof-lifting winds as retribution from a ridge-dwelling territorial sovereign angered by the encroachment of fire into his sacred grove. When evidence was discovereded of a high altitude dairying unit having taken green wood from the forest habitat of climate change-endangered wildlife it was a different kind of anger from a power-wielding coercive agent of a secular variety policing the national park, who delivered the verdict of 'this must stop'. An assertive new army colonel had unearthed an offence, and climate change became a new cause – not simply biodiversity protection alone – for reducing the herds of yak-cow hybrids in the national park.

To diversify a bit more the range of possible interpretations of climate change issues and knowledges, another epistemic community I have encountered in the national park was a group of masters students conducting a survey on climate change perceptions. The research team from Tribhuvan University has made the case that small-scale agro-forestry cycling of carbon between fields, livestock and forests is a very effective management of carbon. Research on smallholder agro-forestry in Rasuwa with its particular range of environmental conditions reveals carbon content of up to 48.6 tons per hectare in soils where mixed agro-forestry is practiced. This demonstrates the benefits of multiple use landscapes for livelihoods that are both resilient in terms of organic metabolism cycles, and for food production, while still being compatible with policies to reduce CO2 emissions (Pandit et al 2013).

It was in 2012 that I was invited by the *chauri* herders to help them find an alternative fuel source to pasteurise the milk and make cheese, and demonstrate to the park that a low carbon energy transition in this niche could be possible. The project history since 2012 to introduce an experimental biogas digester is a case study of how hard it is to shift from a very accessible and well understood energy system of woodfuel to a new systm of uncertain socio-technical potential. Setting up this trial system involved provisional commitments that few people on the ground wanted to take on as the responsible agent. The national park is threatening consequences if changes are not made (but does not help

enable innovation for changing energy source). The cheese factory has a manager on site with an already busy work schedule. The biogas NGO is too remotely located down in Kathmandu to be easily available for consultation and training. The herding men and women have disputes with the cheese factory over the price of milk they are paid, . There was no office for renewable energy promotion active in the district.

This is precisely the kind of contextually dense situation in which a niche innovation could arise. It requires an elective affinity of available materials, economic timeliness, incentive to innovate, shared purpose across interests and institutions, and appropriate actors at hand eager to make political capital in order for a critical momentum to arise to realise this kind of initiative. Renewable energy transitions and communications infrastructures are inevitably part of any contemporary pastureland viability scenario. There is, however, no simple storyline for how renewable energy transitions can act to supplement, or substitute herding livelihoods in hybrid governance. The approach of the Multi-Level Perspective to socio-technical innovation (Geels and Schot 2007) has proven a popular and effective tool to analyse and track transition pathways in industrial economies. An ethnographically informed exercise with the MLP's levels of socio-technical niche, regime, and landscape can shed light on some of the Eurocentric and nation-centric assumptions that accompany this model. The case study from the pastures of Nepal takes the storylines of climate change, labour histories, sentient ecologies, and disputed sovereignties in the direction of rethinking aspects of the generic and mechanistic logic of the MLP for relevance in the Global South.

Coming from the impetus of revised global sustainability agendas, a late-modern rationality of efficient resource governance increasingly makes the case for sub-national, decentralised structures of control and decision-making (Dove and Kammen 2015). Advocates for sustainable directions in climate-friendly energy transitions seek to promote development and innovation 'from below' (Leach et al 2010). The local, the regime, and the landscape scales of action for development activity and planning as regards transitions to sustainability have therefore been significantly reassessed for claims to sustainability value and agency.)

If understood as a heuristic, the Multi-Level Perspective could enable identification of processes and influences that draw attention to particular dynamics, and tendencies for technological 'lock-in', which may well be shared across different examples of landscapes

being re-purposed from grazing systems to alternative uses, with different kinds of sustainability scenarios.

The MLP makes use of 'landscape' as a metaphor for the greater scale of influential presences, acting at the population level, and constituting background conditioning of both environmental parameters and geo-political frames of possibility for whatever innovations might be attempted. In the light of Shove's (2010) comments on how socio-technical transitions thinking abandons old concerns of nature/culture relations, it seems appropriate to make a link to these concerns in anthropology. Strathern (1991) wrote powerfully about *After Nature* as a kind of transition effected by the resource-making opportunities of biotechnology life sciences taking off simultaneously with enhanced climate change awareness bringing an end to the credibility of an idea of nature as a backdrop of life processes autonomous of human intentions. For Strathern, the modern cosmological triangulation of nature, society and individual became flattened into a market of resources and consumers by the 1980s. My argument is that consideration of the factors and influences working on agents for change in the pasturelands of Nepal reveals a role of resource-consumer flattening, which falls short of being hegemonic, and operates almost dialectically with bringing nature-at-risk into relief.

Indeed this framework offers significant insight when the account of labour history is picked up again, and the overturning of peasant productivism can be seen to have fed into the global dominance of fossil fuels. The labour power that once cared intensively for buffaloes and bovines in the mountain forests, now services the growth of the Gulf economies, and other enclaves of industrialization, while the former transhumant pastoralists send remittances home for their wives, parents and children to support domestic consumption. Nature, as a state concept based on a domain to be preserved from human activities (though welcoming to tourists), has thrived better since the Gulf economies have siphoned off the troublesome local people, who were till recently trying to make a subsistence living from small-holder farming.

Lessons from the Nepal case study can be brought to understand socio-ecological innovation as occurring between different levels and scales of relevance. The Euro-centric assumptions of the MLP need a postcolonial review. For a country like Nepal, the International NGOs and Asia's regional economy now has much more influence on actors

and innovations than national socio-technical regimes Climate change, labour histories and territorial belonging in federal ethnic movements call for attention to the interaction of these processes with new class dynamics of land use, and the subjectivities and normative dimensions of social media and cyber-pastoral personhood. The lowly high-pasture shepherd is history. The yak herders have a noble and celebrated profession, but many within their community only give it another thirty years before it will all seem like too much hard work. Many of the same community are in Qatar and Saudi. Their new form of remittance generating livelihood is only a genuine success story for a limited number. The human resource of skills for herding livelihoods is being drawn out of the mountains. It is leaving some desperate traces of relocated labour consciousness and degraded human dignity. A poem was put on facebook by one Nepali migrant labourer

'Forced'
Due to poverty I'm bound to be a foreigner [to live abroad]
When someone dies, no one is here to carry the corpse
There is no one here to understand a man's suffering
It's useless to look for a generous world –
the whole world has become selfish.
(Brusle, forthcoming)

It was partly due to a wish to avoid the dire circumstances of the migrants' experience that in July 2017 I met with the new leader of the chauri herders' cooperative, accompanied by my biogas engineer companion from the UK. This young man from the mountains explained the many fronts on which he was struggling against the state: the Langtang National Park wanting to remove herding altogether; the Dairy Development Corporation reluctant to pay the price for milk that private cheese producers are willing to; and ineffective local government. He considered our proposal to organize the collection of 3,000 kg of yak-cow dung, for 'commissioning' the trial biogas digester, after we undertook a training session for dung collection and mixing with warm water from the solar heater. In another month the *chauri* herds would move closer to the cheese factory. We agreed a sum to fund the collection and porterage of 3,000 kg of dung by a work gang. In September I was sent a video of the gas ring at the cheese factory burning brightly. Transition to low carbon yak cheese is possible after all.

Conclusion

The last thirty-five years have seen a set of rapid and unpredictable changes in the lives of communities in Nepal. People grew up living in animal shelters, and hand-crafted their livelihoods from kin and companion species in a constant shifting of place, in a sentient landscape of enormous diversity and co-presences. As a result of political turmoil, hazardous climate change, and the outpouring of human labour, there is reduced subsistence grazing, but people make tenacious efforts to maintain viability for enterprises of yak-cow hybrids. While once peripheral pastoral landscapes have been dissected into sites for infrastructure, roads and hydro-power, or reserves of protected areas where human livelihoods are seen as anomalous, it would be yet hasty to lose sight of ingenuity and resilience for re-inventing herding practices and rhetorics of sustainability among local communities.

Pastoralists have demonstrated resilient formations of environmental personhood and collective resourcefulness to resituate their sources for renewal. In more than one case they have done so by following the tail of a bull/cow/yak/buffalo to find an enchanted land (the etymology of *lang-tang*, locates the 'plain of the bull' as a sacred refuge - *be-yül*). The political ecology of places like Langtang are now intimately linked to their residents finding pathways to places of livelihood by historically unprecedented routes in modern transport systems. Their meanderings far and wide, attracted by the lure of cash income as opposed to staying among the risks of civil war and climate change, have not exactly delivered them greener pastures, but instead the 'Forced' subjectivity of the migrants in the Gulf (voiced in the poem above). This argument therefore takes a turn back from a systems approach to demonstrate the need for actor perspectives and to understand the relational worlds in which people navigate how they ***are with*** lands and how they ***are with*** animals, even as they are sucked into the webs of wage servitude in the Gulf by the oil and gas industries that perpetrate injustices and vulnerabilities, as routine. Through steps of further anticipatory hope, it can be in the creative new normativities of transformation by infrastructural animation or political decentralization that people and animals will yet find conducive niches for experimenting other possible worlds to transition into, some with the help of quadrupeds.

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